Spring 4-30-1956

Mine Cars of the United States

Edward Sadar

Mining 68
Spring Semester, 1956
Mining Methods

Report
Submitted to
Professor K. S. Stout

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INTRODUCTION

Underground transportation of mineral, waste and supplies is a vital function in mine operation. For this reason the selection and design of a mine car is important. Each type of mine car is constructed for a certain type of job. The design of a mine car is the result or product of the many people connected with its construction. It is the purpose of this report to bring forth many of these ideas by way of discussions, statistical classifications, and drawings of the mine cars.

The information for this report was compiled from questionnaires such as the one reproduced herein. Similar questionnaires were sent to 200 of the operating underground mines of the United States. Of the 200 mining companies receiving the questionnaires, 63 replied to a give a response of 31.5 per cent. Many companies supplied mine car plans which were re-drafted by the author for this report.

The majority of the names and addresses of the mining concerns to which the questionnaires were submitted were taken from the "Directory of U.S. Mining Operations Section", of the Catalog, Survey, and Directory Number, published by Mining World, April 15, 1955.

MINE CAR QUESTIONNAIRE

DATE 24 Feb. 56

COMPANY Gouverneur Talc Co. Gouverneur N.Y.
MINE — MINING METHODS Open Stope DAILY TONNAGE 300
TYPE OF CAR Granby DRAWING NO. —
CAPACITY OF CAR 90 CU. FT. 1.6 TONS —
WEIGHT OF CAR (EMPTY) 2370# COST OF CAR $585 (1947)
CAR CONSTRUCTION: WOOD — WELDED — RIVETED —
STEEL (Welded) ALLOY —
TYPE OF COUPLING: Pin & Link
LENGTH C.C. COUPLINGS 30" HEIGHT ABOVE RAIL 46" WIDTH 45"
WHEELS: HOW MANY? 4 SIZE 12"ϕ MATERIAL C S BEARINGS S.D.
WHEEL SUSPENSION: SPRING — SOLID ✓ OTHER —
WHEEL BASE 24 INS. BRAKES None CAR DUMPING ANGLE 40°
LOCOMOTION: TROLLEY — BATTERY ✓ AIR — OTHER —
SIZE OF MOTIVE POWER 1½ Ton SPEED Max 6 MPH
TRACK GAGE 24" WT. OF RAIL 30# 40# TRACK GRADE 0.5% ±
DIMENSIONS OF HAULAGE LEVEL 8'x8' Drifts Cuts Approximately 7½' x 9½' Ft. Perfect
TOTAL DISTANCE OF AVERAGE TRIP 1600 (Estimated) FT.
AVERAGE NO. OF CARS PER TRAIN 2
MATERIAL HANDLED: AVERAGE SIZE 8" (Estimated) LARGEST SIZE 24"x 36"x 2" (Slabby)
SPECIFIC GRAVITY OF MATERIAL 2.6 to 2.8
TYPE OF MUCK: WET To Dry STICKY When Wet FREE RUNNING When Dry
HOW ARE FINES CLEANED OUT? Blowing with Compressed Air
LOADING: CHUTE ✓ MUCKING MACHINE ✓ SCRAPER ✓ OTHER —
MINIMUM RADIUS OF CURVES New Standards Shoot For 30' Min.
TONS HANDLED BEFORE MAJOR REPAIRS 2,000 (Estimated)
MAINTENANCE COST PER TON-MILE No Records
CAR MANUFACTURER Easton Car & Constr. Co. Easton, Pa.

ADDITIONAL INFORMATION INCLUDING SAFETY FEATURES SHOULD BE DISCUSSED BELOW OR ON REVERSE SIDE.
No Particular Features Felt Worthy of Comment

George E. Gidney
(Signature)
Mine Engineer

UPON COMPLETION ADDRESS TO: EDW. SADAR
RESIDENCE HALL
MONTANA SCHOOL OF MINES
BUTTE, MONTANA

ACKNOWLEDGEMENTS

I wish to thank those whose suggestions and co-operation helped make this report possible. Special thanks go to Professor K. S. Stout for his assistance and suggestive criticisms in the preparation of the questionnaire and body of the report. The author is also indebted to the many mining concerns who responded to the questionnaires. Without their co-operation this report could not have been written.

END-DUMP CARS

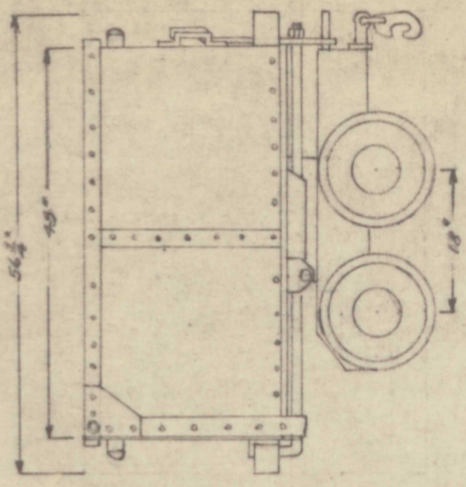
The end-dump car is a small capacity, 4-wheel car used in exploration, preliminary development, and small scale mining, and is generally hand trammed. Mancha-type battery trammers can also be used for tramming end-dump cars.

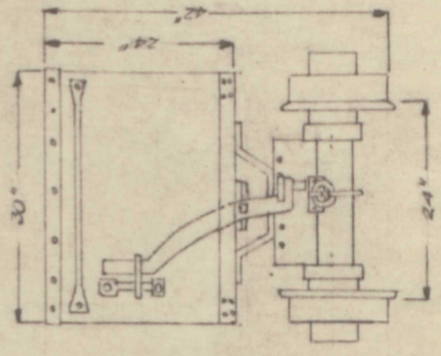
The end-dump car is dumped by a dumping handle located on the opposite end of the car from the dump door. The dump door is opened or locked by this handle. The car can be loaded from chute, mucking machine, or scraper.

Car Nos. 3 and 4. - The body is of welded steel construction. The bottom of the car is lined with 2 3/4-in. fir cushion liner under a regular 5/8-in. iron plate. Both ends of the car can open. The car dumps by means of an air lift directly into the skip. The owners of this car report that

END DUMP CARS

CAR NO	TRACK GRADE	TRACK GAGE	WT OF RAIL	EMPTY WT OF CAR lbs	CAP OF CAR (cu ft)	LENGTH C C COUPLINGS	WIDTH	HEIGHT ABOVE RAIL	WHEEL BASE	DUMPING ANGLE	WHEEL SUSPENSION: SPRING	WHEEL SUSPENSION: SOLID	NO. OF WHEELS	DIA. OF WHEELS	TYPE OF COUPLING	X SECTION HAULAGE LEVEL	ROCK HANDLED: SPECIFIC GRAVITY	ROCK HANDLED: LARGEST SIZE	ROCK HANDLED: AVERAGE SIZE	LOADING: CHUTE	LOADING: MUCKING MACHINE	LOADING: SCRAPER	MINIMUM CURVE RADIUS	DAILY TONNAGE	MINING METHOD	MINE AND/OR COMPANY
1.	-5%	18"	40	1210		44"	26"	45 7/8"	15"			✓	4	12"	Link & Pin	9x7'	2.7	10"	6"	✓	✓		20'	10,000	Vein Mining	Butte Mines Anaconda Co.
2.	-5%	18"	40			40"	24"	45 7/8"	15"			✓	4	12"	Link & Pin	9x7'	2.7	10"	6"	✓	✓		20'	10,000	Vein Mining	Butte Mines Anaconda Co.
3.	1/2%	40"	35-40	6000	100	11'-10"	4'-6"	4'-2 1/2"	36"	35°		✓	4	14"	Link & Pin	8 1/2x11'	2.7	36"	6"	✓	✓		40' - 50'	3000	Open Stope	Iroquois, Allouez Camulet & Hecla Inc.
4.	1/2%	40"	40	12000	150	13'-1 1/2"	5'-8"	4-5"	48"	35°	✓		4	16"	Link & Pin	9x12'	2.7	40"	8-12"	✓			50'	5000	Open Stope	Osceola, Ahmeek Camulet & Hecla Inc.
5	1/4-1/2%	24"	30-45	1795	20	56 3/4"	31 1/4"	42"	18"	40°		✓	4	12"	Ring & Hook	8x8'	4.2	12"	fine to coarse	✓	✓	✓	35'		Square Set	Eagle Mine New Jersey Zinc Co. Gilman, Colo
6	0.2%	18"	12,20	710	16	49"	29.5"	40 1/2"		90°		✓	4		Chain	5x7	3-4	20"	coarse	✓	✓	✓	30'	400	Open Stope	Oswaldo Mine Kennecott Copper Corp.
7.	1/2%	18"	20		20	24"			20"	45°		Semi	4	10"	Chain & Ring	8x10		18"	6-8"		✓			400	Slab & Bench	Kearney Mine New Mexico Cons. M. Co.
8.		20"	40	725	16		29 1/2"	40 1/2	16"			✓	4	10"	Chain	5x7			"A"	✓	✓	✓	50'	150	Open Stope	Mt. Springs Rico Argentine Mining Co.
9					20	24"	18"		23"	90°		✓	4	8"	Swivel			+8"	-6"	✓			40'	10	Drift	Bright Star Wisdom & Mani Enterprises
10					20	24"	18"		23"	90°		✓	4	8"	Swivel			+8"	-6"	✓			40'	50	Drift	President Mine Wisdom & Mani Ent.
11					20	24"	18"		23"	90°		✓	4	8"	Swivel			+8"	-6"	✓			40'	10	Drift	Wellington Wisdom & Mani Ent.





CAR NO. 5 - END-DUMP CAR.

it handles 50,000 - 60,000 tons before major repairs are necessary. The maintenance cost per mile averages $0.03. Fines are cleaned out by a scraper. The No. 4 car has a spring-type suspension, while the No. 3 car is of solid construction.

Car No. 5. - This car is of riveted steel construction. The owners claim that it is inefficient where speed in dumping is vital to production. The cars are also hard to keep on the track when they are bumped by a motor or other cars because of the solid bumper arrangement and short wheel base. The fines are either scraped or tapped out.

ROCKER-DUMP CARS

The rocker-dump car is an intermediate sized, 4 wheeled car used in development and mine haulage work. The body is "V" or "U" shaped and locked in an upright position by trip latches. When the latches are opened the body rolls over on a curved support or rocker at both ends of the car and dumps, and then rolls back over the rocker into its locked upright position. The body has a center of gravity placed in such a way so that when the car is loaded it tends to dump, and when it is empty it tends to remain in the upright position. The construction of the car is simple, and spillage in haulage drifts from this car is at a minimum.

ROCKER - DUMP CARS

CAR NO	% TRACK GRADE	TRACK GAGE	WT OF RAIL	WT OF CAR lbs	CAPACITY OF CAR (CU. FT.)	LENGTH C-C COUPLINGS	WIDTH	HEIGHT ABOVE RAIL	WHEEL BASE	DUMPING ANGLE	WHEEL SUSPENSION: SPRING	WHEEL SUSPENSION: SOLID	NO. OF WHEELS	DIA OF WHEEL	TYPE OF COUPLING	X-SECTION HAULAGE LEVEL	ROCK HANDLED: SPECIFIC GRAVITY	ROCK HANDLED: LARGEST SIZE	ROCK HANDLED: AVERAGE SIZE	LOADING: CHUTE	LOADING: MUCKING MACHINE	LOADING: SCRAPER	MINIMUM CURVE RADIUS	DAILY TONNAGE	MINING METHOD	MINE AND/OR COMPANY
12	3/4%	24"	35	3000	34	98½"	40¼"	48"	36"	45°		✓	4	14"	Link & Pin	7x9'	3.4	30"	6"	✓	✓		25'	1000	Shrink	Moose Mine American Cannac Co.
13	2 3/5%	18"	16	760	20		36"	48"	40"	55°		✓	4	12"	Link & Pin	7x8	2.65	18"	4"		✓		25'	Under Develop		Buckman Mines Buckman Labs. Inc
14	1/2%	24"	60 40	4000	65	10'				90°	✓		4	20"	Wilson	9x13	2.7	12"	2"	✓		✓	75'	1000	Sub-level Stope	Cambria Jackson Cleveland Cliffs Iron Co.
15	3/4%	24"	60	5400	60	10'-9¾"	4'-8"	4'-8"	3'-6"	43°	✓		4	14"	M.C.B	8x10	2.1	36"	-12"	✓	✓	✓	50'	3000	Block-cave	Sunrise Mine Colo Fuel & Iron Corp.
16	1%	18"	20	1320	20				21"	43°		✓	4	10"	Link & Pin	5x7 6x8	2.7	14"	4"	✓	✓	✓			Open Stope	Empire Min. Empire Star Mines Co. Ltd
17	1/2%	24"	25	1000	27	85"	37½	44¾"	30"	30°		✓	4	12"	Link & Pin	6x8	2.7 3.0	6"	Fine Coarse		✓		20'			Rimrock - Eureka Eureka Corp. Ltd
18	1/2%	24"	40		50				42"	40°	✓		4	14"			4.3	24"	18"	✓	✓		50		Open Stope	Gossan Mine General Chemical Div.
19	1%	18"	16 20 30		20				96"	55°		✓	4	8"	Link & Pin			20"	4"	✓	✓			50	Timbered Stope	Brunswick Mine Idaho-Maryland Mines, Corp.
20	0	24"	20	840	26	70¼"	36"	46¼"	23"	30°		✓	4	10"	Link & Pin	6x8		12"		✓			15'	100	Shrink	Kaiser Mine Kaiser Aluminum & Chem. Corp.
21	1/2%	18"	20	1800	30	80"	39"	50"	30"	120°		✓	4	14"	Link & Pin	6x8	2.6	12"	3"	✓	✓		15'		Cut & Fill	Knob Hill Knob Hill Mines, Inc
21A		18"	30	2415	35	8'-0"	46¾"	47"	34"			✓	4	12"	Williston Auto.	8x8	3.4	10"	Sand	✓		✓	50'	1500	Square Set	Magma Copper Co.
22	1/4-1/24	24"	30 45	1795	24	80"	34"	43"	30"	36°		✓	4	12"	Ring & Hook	8x8	4.2	12"	Fine Coarse	✓	✓	✓	35		Square Set	Eagle Mine New Jersey Zinc Co. Gilman, Colo.
23	1/24	27"	30	4000	38	8'3¼"	47"	49½"	26"	40°	Rubber Cushion		4	12"	Alliance Coupler	6x7	3.7	36"	10"	✓	✓	✓	15	500	Shrink Rill	Sterling Mine New Jersey Zinc Co. Franklin, N.J.
23A	2/3%	18"	20 30	2150	30	79½"	39"	52"	36"			✓	4	14"	Willison Auto	7x8	1.8	18"	3"	✓	✓			600	Timbered, Hor Cut & Fill	Sunshine Mine Sunshine Mining Co. Kellogg, Ida.
24	1/2%	24"	40	4650	52				36"	72°	✓		4	14"	Willison "Simplex Knuckle	8x9	5.2		4"	✓					Subtevel Stope	Buck Mine Verona Mining Co.

Car No. 12.- Constructed of welded steel, with solid wheel suspension. The wheels are cast iron. The car can be loaded by chute, and mucking machine. Fines are cleaned out with a blowpipe.

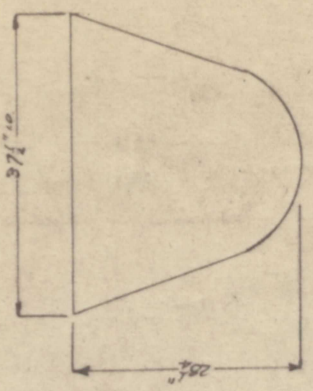
Car No. 15. - Riveted steel construction. The 14-in. semi-steel wheels are suspended on 7-5/8-in. springs of 3-7/8 in. O.D. wire. The car is loaded from chute, mucking machine, scraper, and ramp. Fines are cleaned out with aid of a blow-pipe.

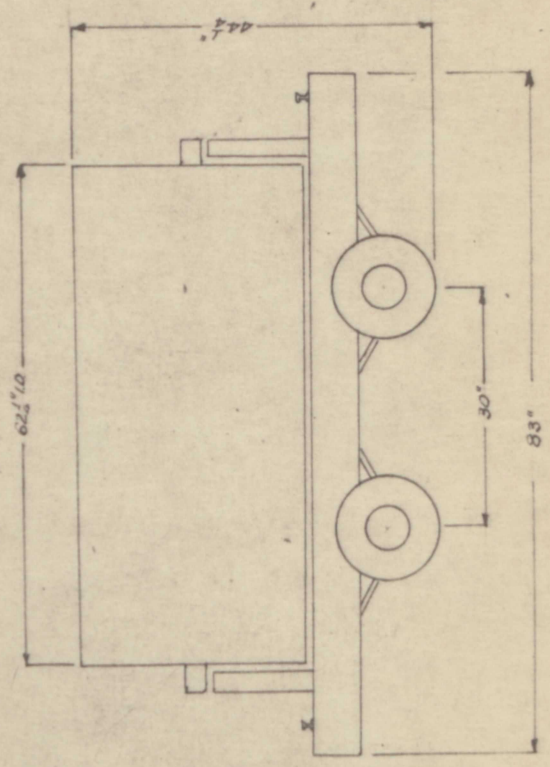
Car No. 17. - The Koppel car is a riveted steel type car. The wheels are attached solidly to the frame.

Car No. 20. - Welded steel body. Fines are cleaned out by using a double-jack on the tilted body. Maintenance costs per ton-mile amount to $0.0034.

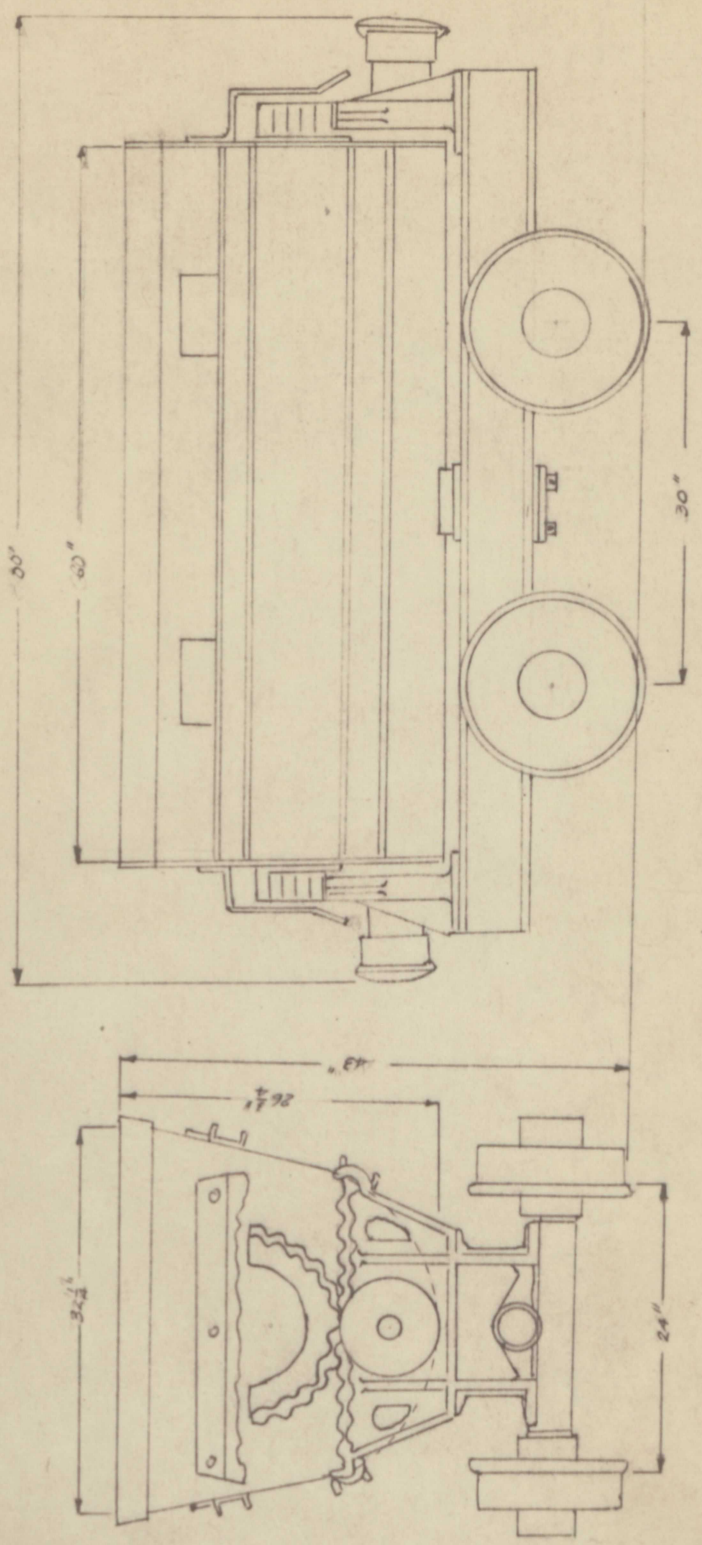
Car No. 22. - Car construction is of welded and riveted steel. The steel wheels have solid suspension. The car has a dumping angle of 36°, either side. Loading is from chute, mucking machine or scraper. A cover plate is provided over the rockers at each end to keep them free of muck and dirt. Fines are cleaned out by scraping or tapping. This car is used to move the major part of the tonnage at the Eagle Mine of the New Jersey Zinc Company.

Car No. 23. - This car is of steel fabrication. The cast steel wheels are attached to the frame by rubber cushioned suspension. Added features are angle steps at the ends of each car for the trainmen to stand on. Safety locking latches on the end of each rocker arm prevent the arm from jarring loose, and the car body dumping during the trip. Safety features at the dump are chain hooks. These are used along with





CAR NO. 17 - ROCKER-DUMP CAR



CAR NO. ZZ - ROCKER-DUMP CAR

bumping bars to prevent car trucks and bodies from turning over while dumping.

GRANBY CARS

The Granby mine car was first developed by the Granby Consolidated Mining, Smelting, and Power Co., Ltd., for its large copper mining operations at Phoenix, B.C., Canada. It is understood that an Englishman Frank Knott devised the car in 1907, while in the employ of the Granby Company. The first cars had roller bearings and link and pin couplers. Later automatic couplers were installed. The Granby Company also used 10-ton capacity Granbys and a large electric shovel for loading to remove rock overburden at their Phoenix operations.

The Granby car is most generally used for high tonnage and high speed transportation because of its simple automatic dumping device. The car is dumped by means of a fifth wheel, commonly called a trunnion or dumping wheel, which is attached to one side of the body. As this dumping wheel rides up a dumping block at the side of the track opposite the ore storage bins, the body of the car tilts and the door opens to discharge the rock. The dumping wheel then rides down the other side of the block and the door closes. These cars can be dumped with an air cylinder also. Loading is from chutes, scrapers, and mucking machines.

Car No. 25. - This car is of welded steel construction. The wheels are of cast iron, and Timken bearings are employed. Corten steel liners are also used. Safety features include kick bar couplers and safety chains. Fines are cleaned out with a blowpipe.

GRANBY CARS

AR. NO	% TRACK GRADE	TRACK GAGE	WT. OF RAIL	WT OF CAR LBS	CAPACITY OF CAR (CU. FT.)	LENGTH C-C COUPLINGS	WIDTH	HEIGHT ABOVE RAIL	WHEEL BASE	DUMPING ANGLE	WHEEL SUSPENSION: SPRING	WHEEL SUSPENSION: SOLID	NO. OF WHEELS	DIA. OF WHEELS	TYPE OF COUPLING	X-SECTION HAULAGE LEVEL	ROCK HANDLED: SPECIFIC GRAVITY	ROCK HANDLED: LARGEST SIZE	ROCK HANDLED: AVERAGE SIZE	LOADING: CHUTE	LOADING: MUCKING MACHINE	LOADING: SCRAPER	MINIMUM CURVE RADIUS	DAILY TONNAGE	MINING METHOD	MINE AND/OR COMPANY
25	3/4%	24"	35 - 45	6000 - 5675	70 - 50	108" - 98"	59" - 59"	56 1/4" - 51 3/8"	42" - 36"	45°	✓ ✓		4	16"	Willson	7x9'	3.4	30"	6"	✓	✓	✓	25'	1000	SHRINK	Howat Mine American Chrome Co.
26	1/2%	24"	60	6000	80	11'-0"	48"	54"		36°		✓	4	16"	Ring & Hook	9x9'	2.78	36"	6"	✓		✓	50'	2000	Room & Pillar	No. 2 American Zinc Co. of Tennessee
27	Max. 5%	36"	60	6825	115	10'-0"	4'-11 1/2"	5'-2 7/16"	3'-6"	45°	✓		4	16"	Willson	9x11	2.7	16"	10"	✓	✓	✓	30'	15000	Block Cave	Kelley Mine Anaconda Co.
28	Max 5%	18"	40	3975	57	9'-5 1/2"	3'-8"	4-6 9/16"	36"		✓		4	14"	Willson	7x9	2.7	10"	6"	✓	✓		20'	10000	Vein Mining	Butte Mines Anaconda Co.
29	.1% 1.3%	36"	60 90	15400	277 1/2	11'-3"	84"	85"	54"	41°	✓	Also Rubber	4	20"	National Malleable Knuckle	9x12	2.64	4-6 Tons	Fines to 4 ton		✓	✓	100'	30000	Block cave	Climax Molbd. Co. Climax, Colo.
30	3/4%	24"	60	8500	120	13'-5"	4'-6 7/8"	5'-0"	4'-6"	50°	✓		4	16"	M.C.B.	8x10	2.1	36"	12"	✓	✓	✓	50'	3000	Block Cave	Sunrise Mine. Colo. Fuel & Iron Corp.
31	1/2%	24"	40		75	8'-0"			42"	40°	✓		4	14"			4.3	24"	18"	✓	✓		50'		Open Stope	Gossan Mine General Chemical Div. - Allied Chem.
32	1/2%	24"	30 40	2370	30	80"	45"	46"	24"	40°		✓	4	12"	Link & Pin	8x8	2.6 2.8	36"	8"	✓	✓	✓	30'	300	Open Stope	Gouverneur Talc. Co., N.Y.
33	1/2%	36"	60	8240	120	11'-8 1/2"	6'-4"	4'4"	3'9"	50°	✓		4	16"	Willison	10x10	2.7	42"	Mine Run			✓	60'	LT 2100	Sublevel Open	Wauseca Mine Hanna Coal & Ore, Michigan
34	3/4%	36"	60		120	10'-8 1/2"	5'-3 3/4"	5'-0"	3'-9"	50°	✓		4	16"	Willison	10x10	2.4	36"	3"	✓		✓	65'	LT 1000	Sublevel Stope	Cannon Mine Hanna Iron Ore Co. Iron River, Mich.
35	1/2%	24"	60		100	11'-0"	60"	56 3/4"	48"	43°	✓		4	16"	M.C.B.	7x9	1.6	4"	-4"	✓			60'	900	Shrink	Treasury Mine Idarado Mining Co.
36	1/2%	24"	45		60	9'-6"	58 1/2"	55 1/4"	36"	43°	✓		4	14"	M.C.B	7x9	1.6	36"	8"	✓	✓		60'	900	Shrink	Treasury Operation Idarado Mining Co.
37	1/2%	36"	60	3600	70	8'-10 1/8"	60"	50 1/4"	40"			✓	4	14"	Willison	9x10	2.5	12"	Fine	✓	✓		75'			Brock Creek Tunnel Montana Phosphate Products
38	1/2-1%	30"	60		100	11'-6 3/4"	4'-4"	4'-7 3/8"	3'-6"	50°	✓		4	16"	Willison	9x9	3.2	18"	-6"	✓	✓		50'	1800	Sublevel Cave & Stope	Penokee Mine North Range Mining Co., Mich.

GRANBY CARS

CAR NO.	% TRACK GRADE	TRACK GAGE	WT. OF RAIL	WT. OF CAR lbs	CAPACITY OF CAR (CU FT)	LENGTH C-C COUPLINGS	WIDTH	HEIGHT ABOVE RAIL	WHEEL BASE	DUMPING ANGLE	WHEEL SUSPENSION: SPRING	WHEEL SUSPENSION: SOLID	NO. OF WHEELS	DIA. OF WHEELS	TYPE OF COUPLING	X-SECTION HAULAGE LEVEL	ROCK HANDLED: SPECIFIC GRAVITY	ROCK HANDLED: LARGEST SIZE	ROCK HANDLED: AVERAGE SIZE	LOADING: CHUTE	LOADING: MUCKING MACHINE	LOADING: SCRAPER	MINIMUM CURVE RADIUS	DAILY TONNAGE	MINING METHOD	MINE AND/OR COMPANY
39	1 9/20	24"	40	5700	75	10'-2 3/4"	4'-5"	4'-11 7/16"	42"	50°	✓		4	16"	Willisen	10x12	2.4	24"	-4"		✓	✓	60'		Sub level caving	Sunday Lake Sunday Lake Iron Co., Mich.
40	2 1/20	24"	70	2600	76 1/2	11'-6"	5'-0"	45"	44"	45°	✓		4	14"	M.C.B.	9x24	2.1	36"	12"		Joy Loader		40'		Room & Pillar	U.S. Potash Co. Carlsbad, N.M.
41	1/4 %	24"	20 40	3950	57	8'-9"	4'-9"	4'-8"	48"	45°	✓		4	16"	Williston	7x9	2.3	12"	1/2"	✓	✓	✓			Long-hole Stope with forward lateral	Canyon Creek Mine Victor Chemical Works, Montana
42	1/3 %	24"	40	3950	57	8'-9"	4'-9"	4'-8"	48"	45°	✓		4	16"	Williston	7x9	2.3	14"	1/2"	✓	✓				Sub-level Stope	Maiden Rock Victor Chem. Works Montana.

Car No. 27.- Alloy material in body. Wheels are of forged steel, and ball bearings are used. A Card car-cleaner is used to remove the fines.

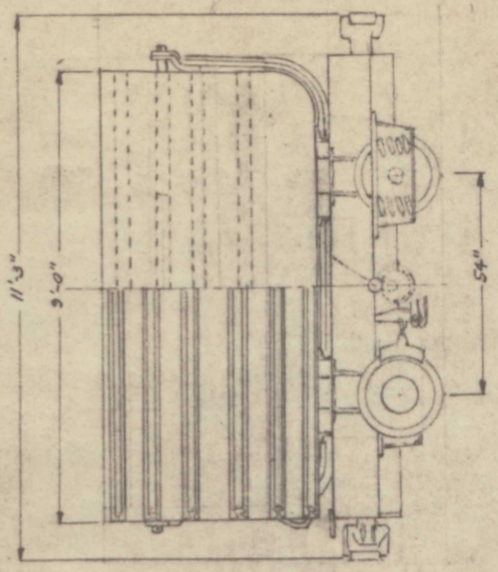
Car No. 29. - This car is fabricated of welded and riveted steel. The cost of the car was $3597.40. The wheels are made of manganese chilled steel. Timken cone and cup bearings are used. A wooden cushion is used on the bottom and sides of the car. Jalloy wearing plates are welded to the car bottom. Safety features include chains between the cars, and air brakes which are tested frequently. Fines are cleaned out with aid of a clean-out machine.

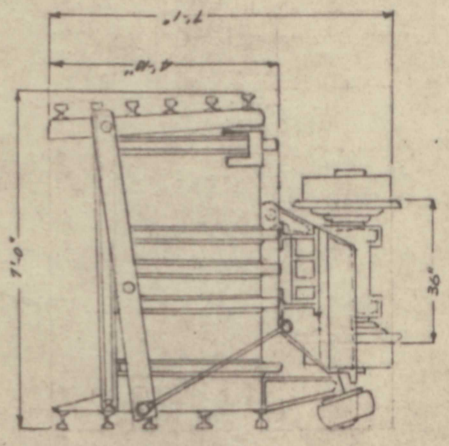
Car No. 30. - Riveted steel body construction. Cost of this car in 1942 was $1060.00. Wheels are of cast iron. The average wheel and truck spring is replaced every 70,000 tons. The car is dumped by means of a 19-in. air cylinder. Air blowpipes are used to remove the fines.

Car No. 32. - Constructed of welded steel. Cost of the car was $585.00 (1947). Wheels are cast iron. Bearings are a roller type. Tons handled before major repairs amounts to 42,000 tons. Fines are cleaned out by compressed air.

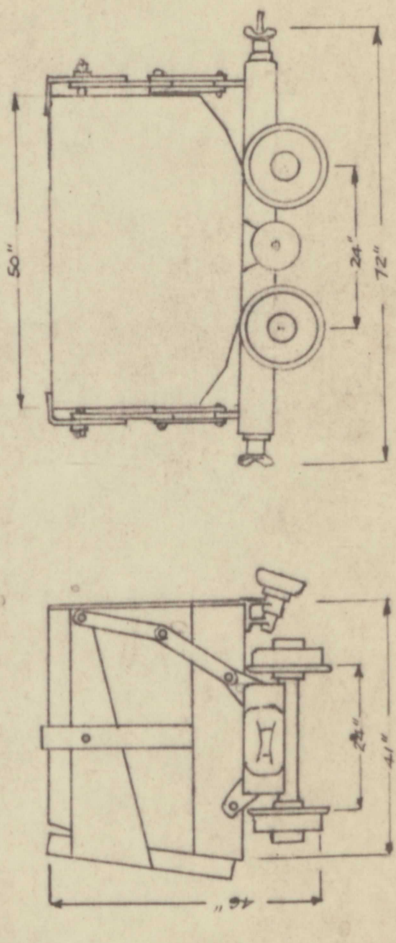
Car No. 33. - Welded steel construction, with alloy wear plates. Rolled steel wheels and Timken bearings are used. Tons handled before major repairs is about 100,000 tons. Maintenance cost per ton-mile is $0.0125. Fines are cleaned out with a blow-pipe.

Car No. 34. - Welded steel body with alloy liners. Car cost was $1750.00. Wheels and bearings are simlar to Car No. 33. Bushings on the dump-pin are lubricated as necessary. Cars are dumped with an overhead dump cylinder. Fines are removed by blow-pipe and vibrator.

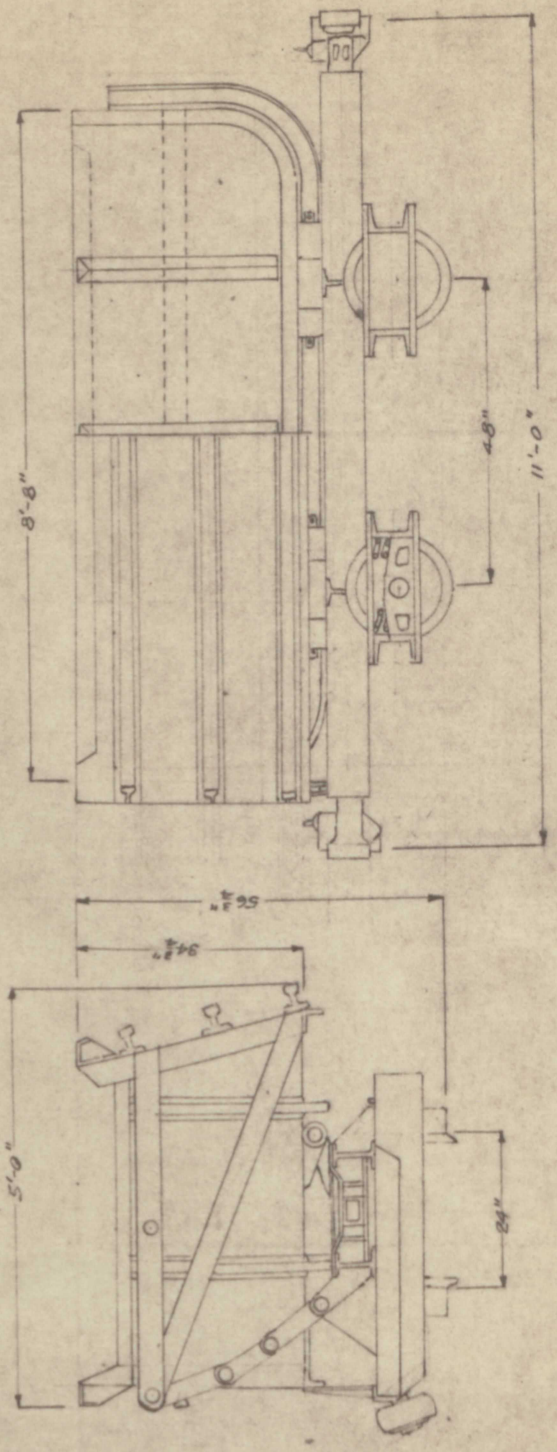




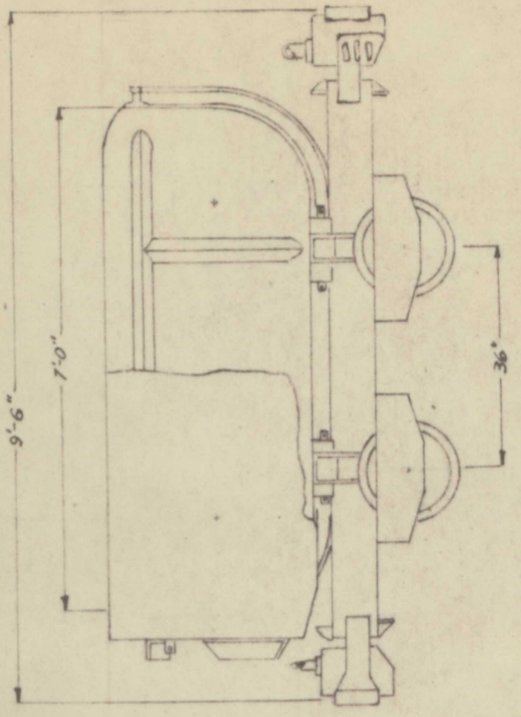
CAR NO. 29 - GRANBY CAR

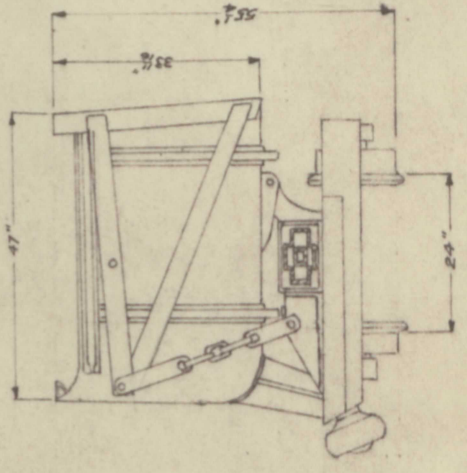


CAR NO. 32 - GRANBY CAR



CAR NO. 35- GRANBY CAR





CAR NO. 36 - GRANBY CAR

Car No. 38. - Welded steel construction. Cost of the car was around $1850.00. Timken bearings and steel wheels are used. Cars are dumped by a 12-in. air cylinder.. This company rebuilds the car wheels by submerged arc welding.

Car No. 40. - Cost of this car was $900.00 Car construction is of welded steel. Safety chains are employed between cars. A safety step is located on one side of the car. Wheels are of steel with roller bearings.

COAL CARS

These cars are chiefly the rotary-dump box-type car. They are large in relation to other types of mine cars, and generally operate on a track gage greater than 40 ins. Minimum curve radius is usually larger than 25 ft.

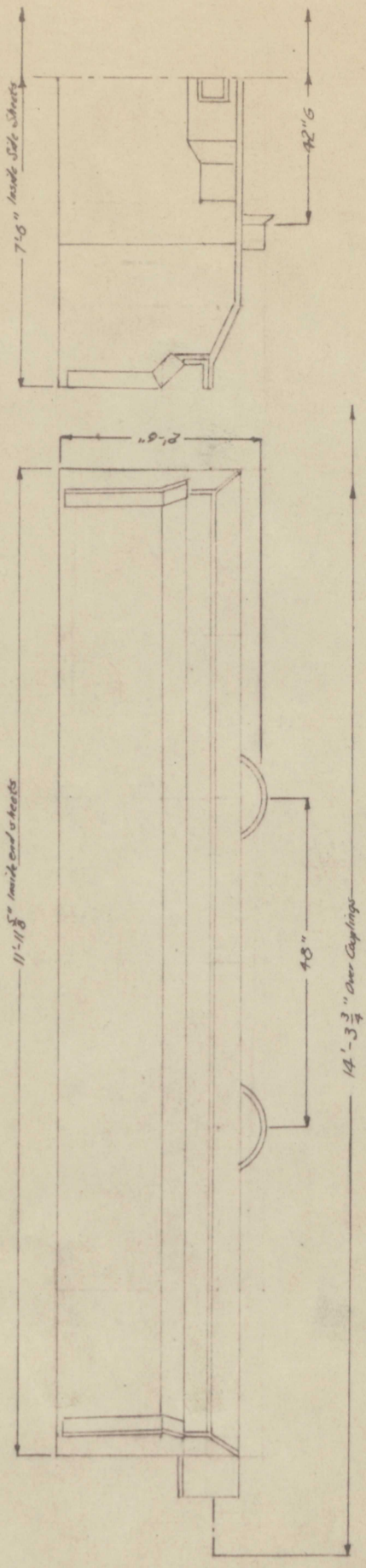
Car No. 43. - This is a rotary-dump car constructed of steel with a wooden bottom.. The cost of the car was $1000.00. Timken roller bearings and steel wheels are used on the trucks. Preventive maintenance is used at all times. Maintenance costs per ton amounts to $0.051, per ton of clean coal. Safety features include wheel skids in place of brakes. This practice avoids wear on wheels due to sliding on the rail.

Car No. 44. - Riveted steel body. Car cost was $700.00. Wheels are of nickel-cobalt alloy. Timken bearings are also used. Skids are employed to brake the car when necessary.

Car No. 47. - This car has a welded steel body, and cost $1400.00.. Floating axle wheel suspension is used. Steel wheels and Timken bearings are used throughout.

COAL CARS

CAR NO.	TRACK GRADE	TRACK GAGE	WT OF RAIL	WT. OF CAR lbs	CAPACITY OF CAR (cu ft)	LENGTH C-C COUPLINGS	WIDTH	HEIGHT ABOVE RAIL	WHEEL BASE	TYPE OF CAR	WHEEL SUSPENSION: SPRING	WHEEL SUSPENSION: SOLID	NO. OF WHEELS	DIA. OF WHEELS	TYPE OF COUPLING	X-SECTION HAULAGE LEVEL	ROCK HANDLED: SPECIFIC GRAVITY	ROCK HANDLED: LARGEST SIZE	ROCK HANDLED: AVERAGE SIZE	LOADING: CHUTE	LOADING: MUCKING MACHINE	LOADING: SCRAPER	MINIMUM CURVE RADIUS	DAILY TONNAGE	MINING METHOD	MINE AND/OR COMPANY
43	Max 5%	44"	60	6500	153	13'-0"	6'-0"	41 1/8"	44"	Rotary		✓	4	16" 24"	Link	x25	1.8	48"	8"	✓	Conveyor Loader		25'	3800	Mechanical	No. 9 Mine Carbon Fuel Co., W. Va.
44	2 1/2%	48"	60	5000	153	176 1/2"	90"		54"	Up-end dump		✓	4	14"	Link - rubber bumper	5x18'	1.35	16"	Run of mine	Elevator			25'	3150	Mechanical	No. 6 Mine Island Creek Coal Co., W. Va.
45	2%	44 1/2"	60	5500	152	144"	81"		40"	Rotary		✓	4	14"	Split Link	5x12'	1.35	16"	Run of Mine	Elevator			25'	6000	Mechanical	No. 22 Mine Island Creek Coal Co., W. Va.
46	1%	44 1/2"	60	11000	388.7 443.9	26'-0"	7'-0"		19'-6"	Rotary		✓	8	14"	Willison Auto.	5 1/2x12'	1.35	20"	Run of Mine	Elevator			45'	7500	Mechanical	No. 25 Mine Island Creek Coal Co., W. Va.
47	Max 2%	42"	80 90	4750	190	14'-0"	7'-6"	36"	48"	Rotary	Floating axle		4	14"	Allen & Garcia Semi-auto		1.5	24"	-		Belt		80'	3200	Mechanical	No 5. Mine Sahara Coal Co. Corp, Illinois.



CAR NO. 47 - ROTARY-DUMP CAR

MISCELLANEOUS CARS

A total of 31 data sheets, and 6 prints were received. Brief descriptions of some of the cars are as follows:

Car No. 54. - This is a gable-bottom side-dump car. These cars were built at Anaconda, Montana, for special service in the Anaconda Company's phosphate mines at Conda, Idaho. The body is of riveted steel, and Timken bearings are used.

Car No. 55. - This is the "Big Sam" car of the Bunker Hill Company's Kellogg, Idaho, mine. The body is of welded steel with side boards. The car cost was $852.66. Wheels are made of rolled steel. Hyatt bearings are used. Fines are cleaned out with aid of an air hammer. The car has a hopper bottom dump.

Car No. 56. - This is a rotary-type, 8-wheel car. Body is of steel. Anti-friction bearings are used. Wheels are a cast type. Tons handled befor major repairs averages 200,000 tons.

Car No. 59A. - This car is a gable-bottom side-dump car. The body is of welded steel . Cast wheels and babbit bearings are employed.

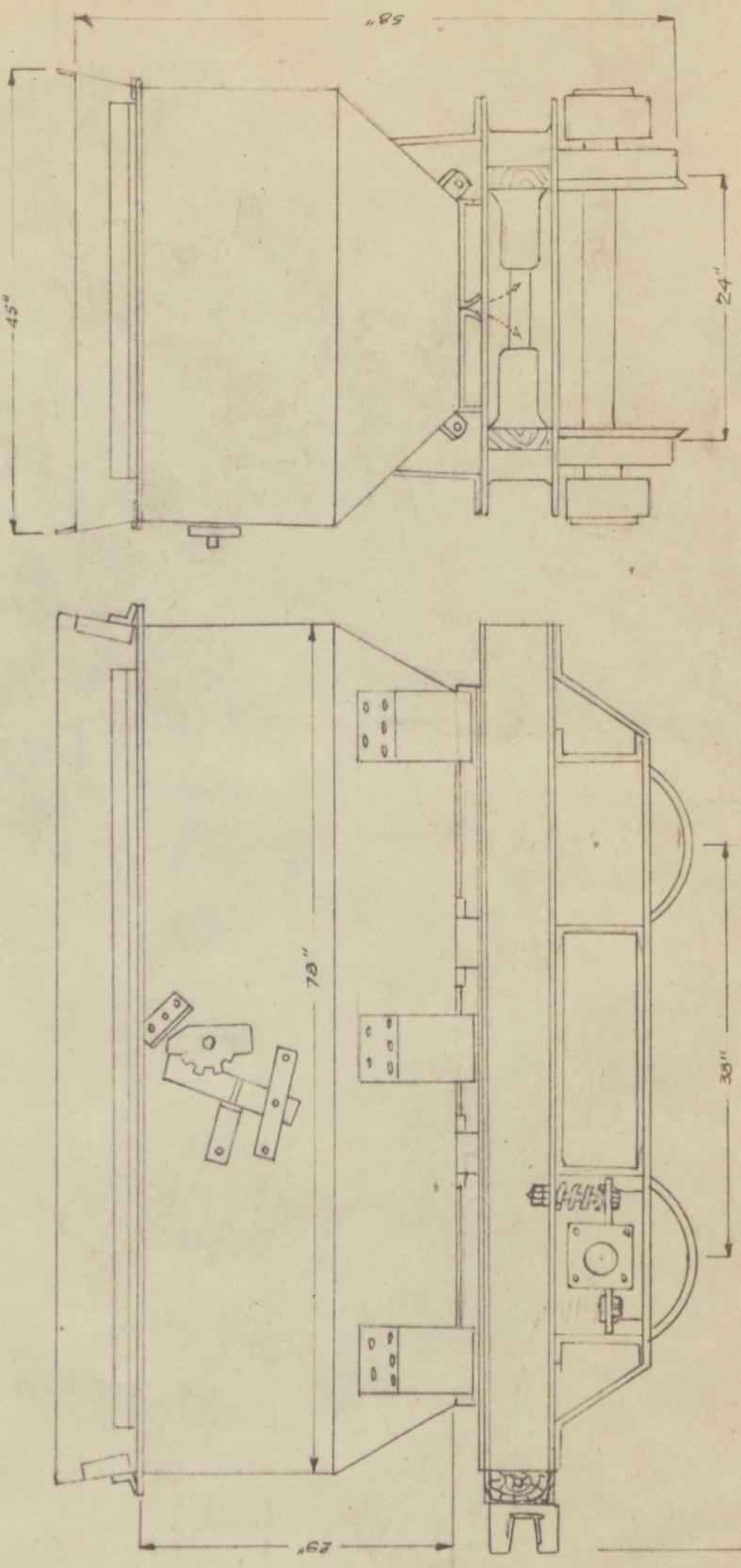
Car No. 60. - A gable-bottom side-dump car of welded and riveted steel. The bottom and wheels last 4 to 5 years before replacement is warranted. The car lasts about 10 years before a general overhaul is necessary. Tons handled prior to major repairs amounts to 250,000 tons. Maintenance cost is $0.01 per ton-mile. Timken bearings and cast wheels are used. Initial car cost was $1300.00.

MISCELLANEOUS CARS

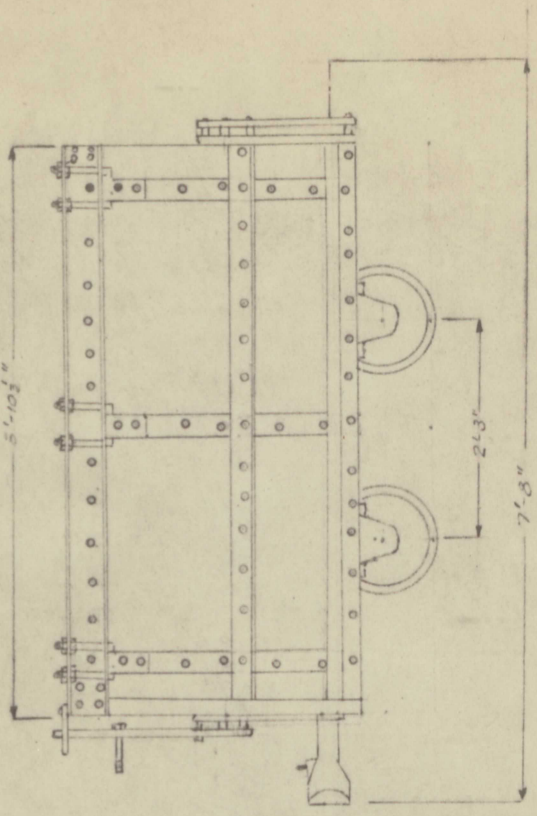
CAR NO.	TRACK GRADE	TRACK GAGE	WT. OF RAIL	WT. OF CAR lbs	CAPACITY OF CAR (cu ft)	LENGTH C-C COUPLINGS	WIDTH	HEIGHT ABOVE RAIL	WHEEL BASE	DUMPING ANGE	WHEEL SUSPENSION: SPRING	WHEEL SUSPENSION: SOLID	NO. OF WHEELS	DIA. OF WHEELS	TYPE OF COUPLING	X-SECTION HAULAGE LEVEL	ROCK HANDLED: SPECIFIC GRAVITY	ROCK HANDLED: LARGEST SIZE	ROCK HANDLED: AVERAGE SIZE	LOADING: CHUTE	LOADING: MUCKING MACHINE	LOADING: SCRAPER	MINIMUM CURVE RADIUS	DAILY TONNAGE	TYPE OF CAR	MINE AND/OR COMPANY
48	2%	18"	12	1800	18		24"	36"		46°		✓	4			5x7'		12"	6-6"					Nil	Tubular Axle	Earnest Affrandino Eureka, Nev.
49	2%	18"	12		25		26"	40"		46°		✓	4			5x7'		12"	2-6"					Nil	Truax	Earnest Affrandino Eureka, Nev.
50	1%	18"	12		14		22"	36"				✓	4			5x7'		6"	2"					Nil	Truax	Earnest Affrandino Eureka, Nev.
51	1%	36"	40		124	13'-10½"	5'-8¾"	33"	64"	Bottom Dump	✓		4	16"	Ring & Pin	10x11'		30"	10"	✓			50'	850	Bottom Dump	Grandview Mine American Zinc, Lead & Smelting Co.
52	1%	48"	40	9000	120	13'-10¾"	6'-6"	42¾"	46"	Bottom Dump	✓		4	16"	Ring & Pin	11x12'		30"	12"				75'	200	Bottom Dump	Grandview Mine American Zinc, Lead Smelting Co.
53	1%	18"	40	2000	40	80"	43"	49½"	30"	40°		✓	4	14"	Ring & Pin	8x9		30"	12"	✓			50'	750	Side Dump	Grandview Mine American Zinc, Lead Smelting Co
54	0.5%	36"	65	19,500	200	18'-0"	6'-0"	5'8"	84"	50°			8	24"	Knuckle	10x10	2.9	8"	3"	✓			200'	400	Gable Side Dump	Conda, Ida. Anaconda Co.
55	Varies	24"	40-90	6600	67.2	6½'	45"	58"	38"	Hopper Bottom	✓		4	14"	Link & Pin	8x9	1.8			✓	✓			1800	Hopper Bottom Dump	Bunker Hill Co. Kellogg, Ida.
56	3%	24"	45	6300	178	18¼'	48"	57"	8'-9"	Rotary	✓		8	10"	Swivel	8x9		12"	6"	✓			50'	1000	Solid - Differential Rotary	Calera Mining Co., Cobalt, Ida
57		18"	24	1980	32		42½"		30"			✓	4	14"	Link & Pin	6x7	4.0	24"	10"	✓	✓		40'	100	Side-Dump	Clayton, Ida Clayton Silver Mines
58	1%	18"	16-30	1600	27		33"	48"	20"	45°		✓	4	12"	Draw Bar	6x7	1.6	18"	6"	✓	✓		23'	20	Ogden	Hand Mines Dillon, Mont.
59	1%	36"	60		120	11'-8½"	6'-4"	4'4"	3'-8"		✓		4	18"	Willison	9x9	3.0	72"	24"			✓	60'	1600	Side Dump	Homer Mine Hanna Iron Ore Co., Mich.
59A	Varies	18"	30	2400	40	7'-6"	46"	45"	27"			✓	4	12"	Alliance	8x8	3.2	10"	5"	✓	✓	✓	50'	1500	Gable Bottom	Magma Copper Co.
60	1%	24"	45	5000	86		60"		30"		✓		4	16"	Link & Pin		2.56	18"	6"	✓			41.25'	12000	Gable Bottom	Miami Copper Co.
61	3%	18"	20-30														3.0	18"	6"	✓	✓	✓	12'	100	Car & Flat	Jefferson Mine Minerva Oil Co.

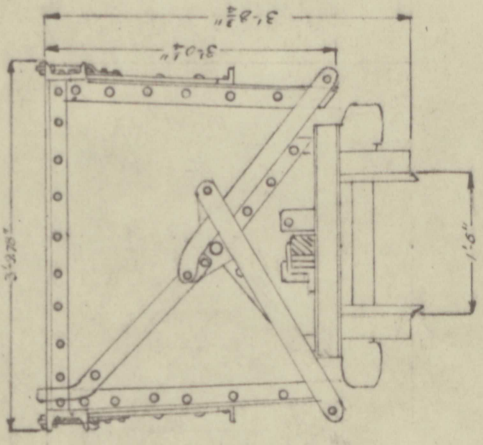
MISCELLANEOUS CARS

CAR NO.	TRACK GRADE	TRACK GAGE	WT. OF RAIL	WT OF CAR lbs	CAPACITY OF CAR (CU FT)	LENGTH C-C COUPLINGS	WIDTH	HEIGHT ABOVE RAIL	WHEEL BASE	DUMPING ANGLE	WHEEL SUSPENSION: SPRING	WHEEL SUSPENSION: SOLID	NO. OF WHEELS	DIA. OF WHEELS	TYPE OF COUPLING	X-SECTION HAULAGE LEVEL	ROCK HANDLED: SPECIFIC GRAVITY	ROCK HANDLED: LARGEST SIZE	ROCK HANDLED: AVERAGE SIZE	LOADING: CHUTE	LOADING: MUCKING MACHINE	LOADING: SCRAPER	MINIMUM CURVE RADIUS	DAILY TONNAGE	TYPE OF CAR	MINE AND/OR COMPANY
62	1%	18"	20 25	1875	33		42½"	47½"	36"			✓	4	14"	Pin	8x8'	2.7	12"	Fines	✓	✓				Ajax Side Dump	Montana Phosphate Products. Co.
63	3%	18"	40	4000	55	8'-0"	3'-10"	4'-0"	4'-0"	50°	✓		8	15"	Link & Pin		4.7	12"	6"	✓			40'	400	Gable Bottom	Richmond Mine Mountain Copper Co. of Calif.
64	level	36"	60		130	11'-3½"	82"	72"	55"	45°		✓	4	18"	Drawbar & Pin	8x10'	4.2	10"	fine coarse	✓			Straight track		Gable Bottom	Eagle Mine New Jersey Zinc Co. - Gilman
65	¼-½%	24"	30 45	3500	48¾	103"	53"	48"	30"	45°		✓	4	14"	Drawbar & Pin	8x10	4.2	12"	fine coarse	✓			35'		Gable Bottom	Eagle Mine New Jersey Zinc Co., Gilman, Colo
66	½%	24"	35	2500	32	6'-10"	36"	54"	36"	36°		✓	4	12"	Spring Bumper		2.7	12"	4"	✓	✓		20'	2400	Side Dump	Pend Oreille Mines & Metals Co.
67	3/4%	36"	60	10,800	148½	12'-6"	6'-3"	5'-5¾"	60"	45°	✓		4	16"	Willison	9x12'	3.0	24"	12"	✓	✓	✓	80'	5000	Side Dump	Old Bed Mine Republic Steel Corp. N.Y.
68	+-8%	24"	30 60 70	11,000	219	24'	51"	44"	17'-4"	45°	✓		8	16"	Drawhead link & pin	9x10'	2.92	20"	6"	✓	✓		100'	21,900	St. Joe Solid Bed	St. Joseph Lead Co., Mo.
69	+-8%	24"	30 60 70	3650	48	7'-4½"	51 1/16"	40¾"	28"	45°		✓	4	16"	Drawhead link & pin	9x10	2.92	20"	6"	✓	✓		100'	21,900	St. Joe Solid Bed	St. Joseph Lead Co., Mo.
70	Max 45%	48"	60 80	10,800	420	22'-6"	7'-6"	3'-6"	192"	360°	✓		8	12"	Willison Auto	7x24'	1.9	36"	20"		✓		50'	3700	Rotary Dump	Southwest Potash Corp., Carlsbad N.M.
71	½%	42"	60	10,434	143	12'-10"	7'-0"	5'-0"	7'-6"	45°	✓		8	10"	Rotating Barrel link & pin	12x12'	4.0	48"	24"	✓			35'	1500	Side Dump	Boyd, 14 level Tennessee Copper Company.
72	½%	24"	60	8000	90	12'-2"	5'-0"	4'-6½"	3'-2"	47°	✓		4	16"	Willison Auto	8x8'	4.0	24"	12"			✓	20'	1100	Side Dump	Eureka, 8 level Tennessee Copper Co.
73	½%	24"	60	6700	130	11'-3½"	5'-2¾"	49"	6'-6"		✓		8	10"	Willson Auto	9x9'	4.0	48"	12"	✓			20'	1200	Solid Body Rotary dump	Boyd, 10 Level Tennessee Copper Company.
74	½%	18"	40		120		4'0"	50"	7'-10"				8	15"	Bar & pins	8x9'				✓			30'	250-300	Gable Bottom	Triumph Mine. Triumph Mining Co., Ida
75	½%	18"	20 30 40									✓	4	13"	Bar & Pins					✓	✓	✓	20'	250-300	Side Dump	Triumph Mine Triumph Mining Co., Ida
76	2½%	42"	70	8000	205⅓	16'-7¾"	5'-3"	48"	50"		✓		4	18"	Willison	9x24'	2.1	36"	12"		Joy Load.		40'	6500	Drop-Bottom	U.S. Potash Co. Carlsbad, N.M.
77	½%	48"	60				54"	38"	48"		✓		4	16"	Link & Pin	11x11'	2.65				✓		50	800	Bottom Dump	Utex Explor. Co Moab, Utah.



CAR NO. 55 - HOPPER BOTTOM





CAR NO. 59A - GABLE-BOTTOM
SIDE DUMP

Car No. 61. - Gable-bottom type of car which cost $1200.00. Steel wheels are mounted on Hyatt bearings to cast steel trucks. The car has 8 wheels. The wheels are replaceable with cast steel tires..

Car No. 64. - This is a gable-bottom side-dump car commonly called a Larry Car, and is used in transporting ore from mine storage pockets to a loading tipple or bin. This car cost $3100.00 in 1920.. Car construction is of welded and riveted steel and alloy.

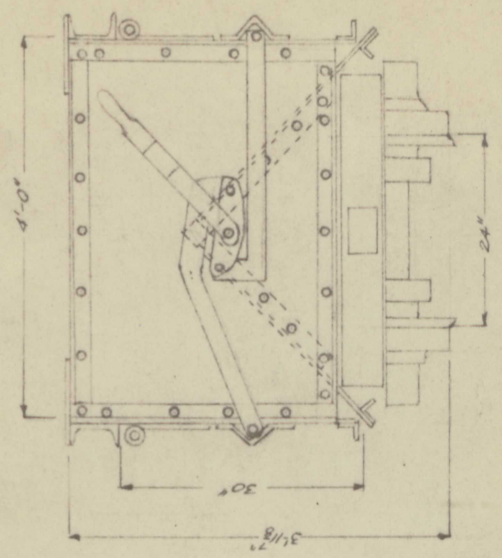
Car No. 65. - Gable-bottom side-dump car. Cost was $404.00 in 1920. Construction is of welded and riveted steel. Steel wheels and roller bearings are used.

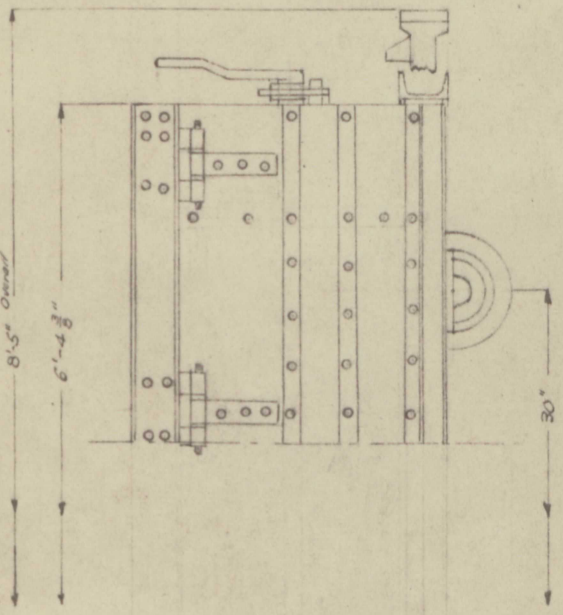
Car No. 68. - This car is the famous St. Joe Solid Bed. The car cost was $2200.00, and car construction is of welded steel. The car is dumped by a rotary dumper, and fines are cleaned out by car knockers and pneumatic spades. Maintenance cost per ton is $0.03..

Car No. 69. - Similar to, but smaller than car No. 68.

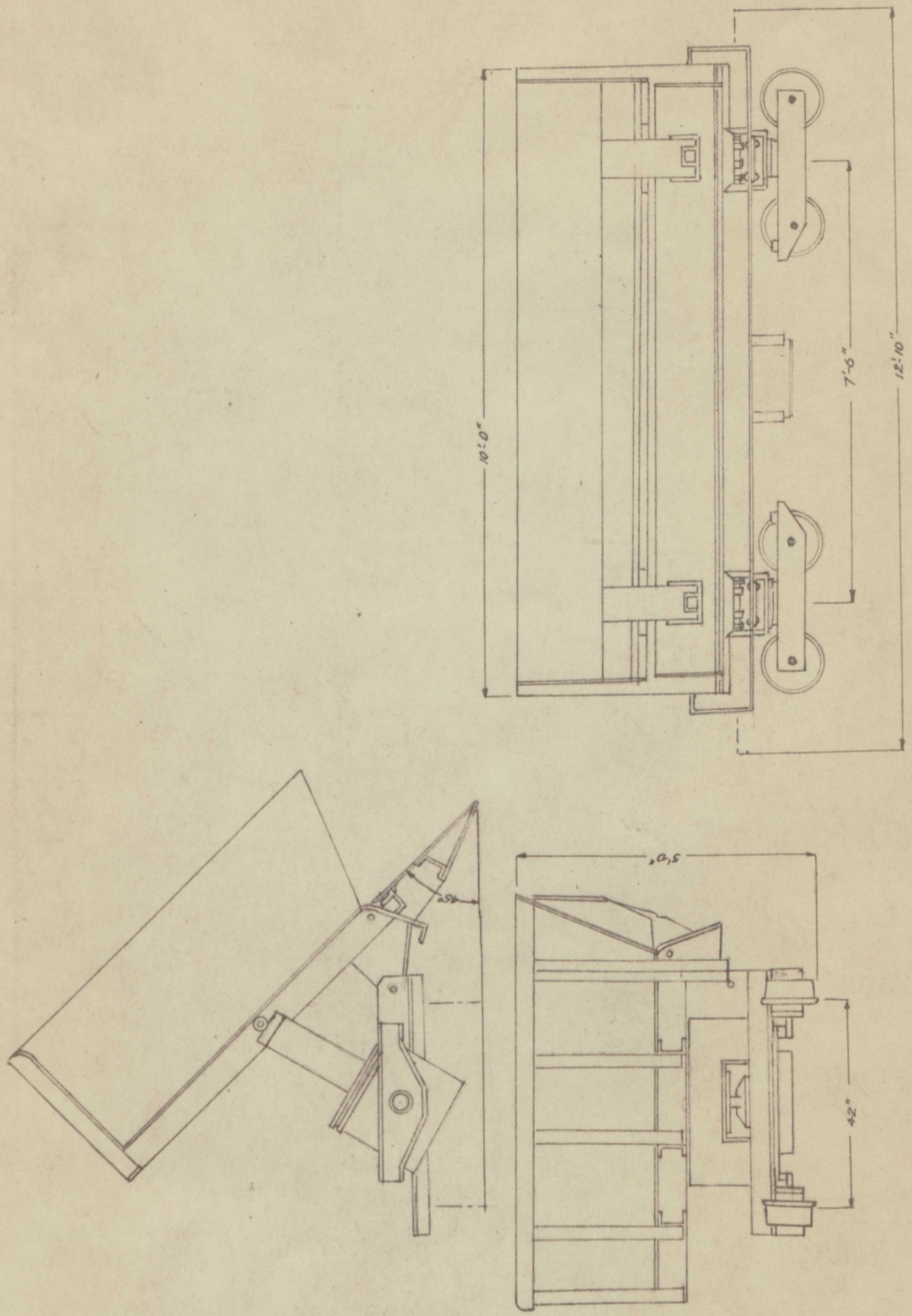
Car No. 71. - This is a side-dump car costing $2732.00. Tons handled before major repairs amounted to 100,000 tons. Maintenance cost per ton amounted to $0.08. The car is dumped by connecting an air hose to a dump cylinder on the car. A 1-in. liner is added to the bottom and lip of the car for wear. Forged steel wheels and tapered roller bearings are used.

Car No. 72. - This is another type of side-dump car. The cost of the car was $1500.00. Rolled steel wheels and tapered roller bearings are used.. Dumping is by an air cylinder set below

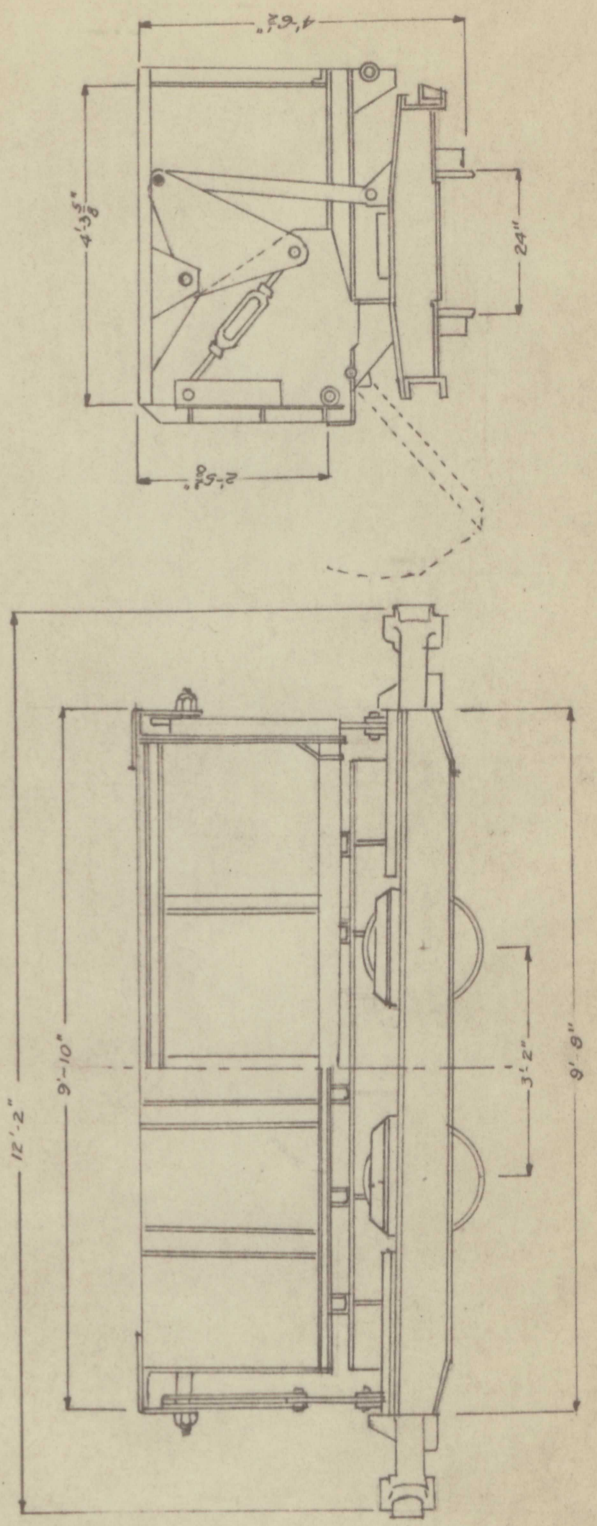




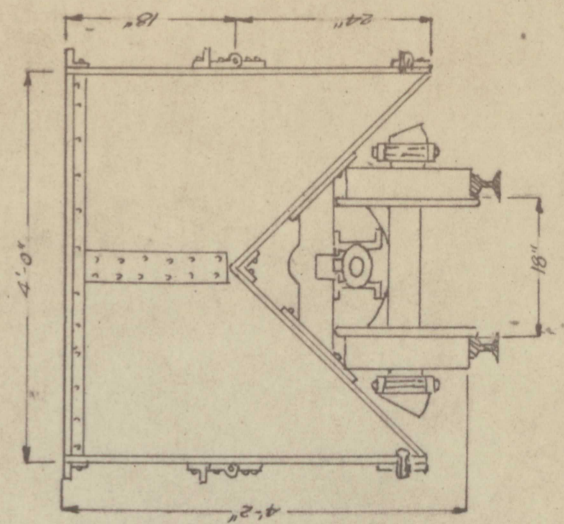
CAR NO. 65 - GABLE BOTTOM SIDE DUMP

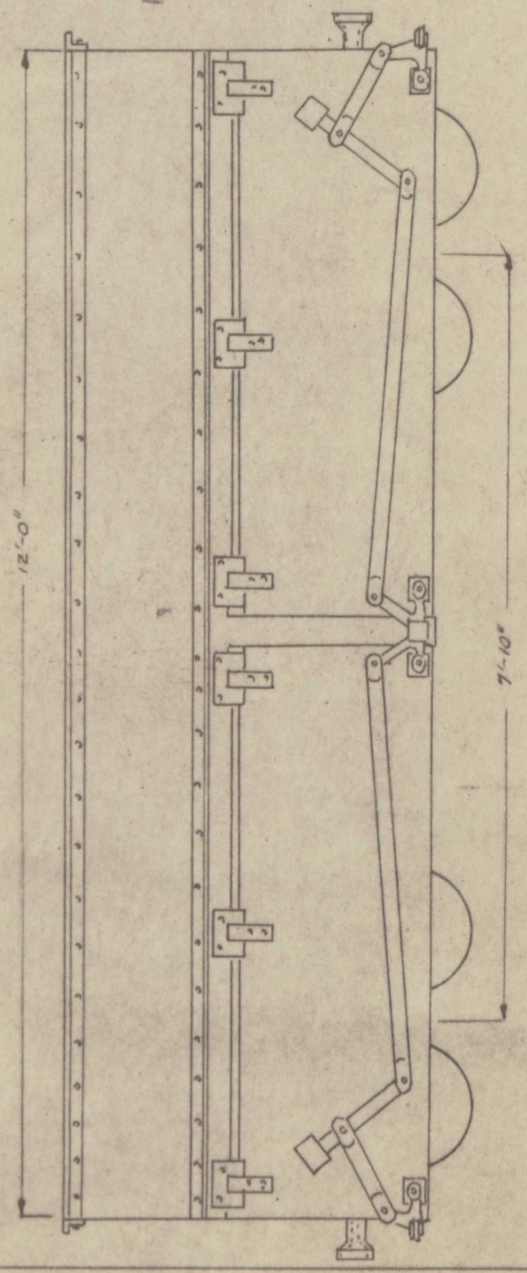


CAR NO. 71 - SIDE DUMP CAR



CAR NO. 72 — SIDE-DUMP CAR





CAR NO. 74 - GABLE BOTTOM
SIDE DUMP

SUMMARY OF MINE CARS

TYPE OF CAR		CAR CAP. Cu. Ft.	WT. OF CAR Lbs	LENGTH	WIDTH	HEIGHT	WHEEL DIAMETER	WT. OF RAIL lb/3ft.	TRACK GAGE	WHEEL BASE	DUMPING ANGLE	LARGEST PIECES	NO. OF CARS STUDIED
END-DUMP													11
SIZE:	MIN.	16	715	49"	29½"	40½"	10"	30	18"	16"	90°	20"	
	MAX	150	12000	13'-1½"	5'-8"	4'-5"	16"	40	40"	48"	35°	40"	
	AVG	20	1795	24"	18"		8"	20	18"	23"	90°	8"	
ROCKER-DUMP													15
SIZE:	MIN	20	760		36"	48"	12"	16	18"	40"	55°	18"	
	MAX	60	5400	10'-9¾"	4'-8"	4'-8"	14"	60	24"	40"	43°	36"	
	AVG	35	2415	8'-0"	46¾"	47"	12"	30	18"	34"		10"	
GRANBY													18
SIZE:	MIN.	30	2370	80"	45"	46"	12"	30	24"	24"	40°	36"	
	MAX	277½	15400	11'-3"	84"	85"	20"	90	36"	54"	41°	4-ton	
	AVG.	80	6000	11'-0"	48"	54"	16"	60	24"		36°	36"	
COAL													5
SIZE:	MIN	190	4750	14'-0"	7'-6"	36"	14"	80	42"	48"	360°	24"	
	MAX	444	11000	26'-0"	7'-0"		14"	60	44½"	19'-6"	360°	20"	
	AVG	153	6000	12'-5"	76"		14"	60	48"	69"	360°	16"	

the track level at the pocket. Maintenance cost per ton-mile is $0.08. Body is of welded steel.

SERVICE CARS

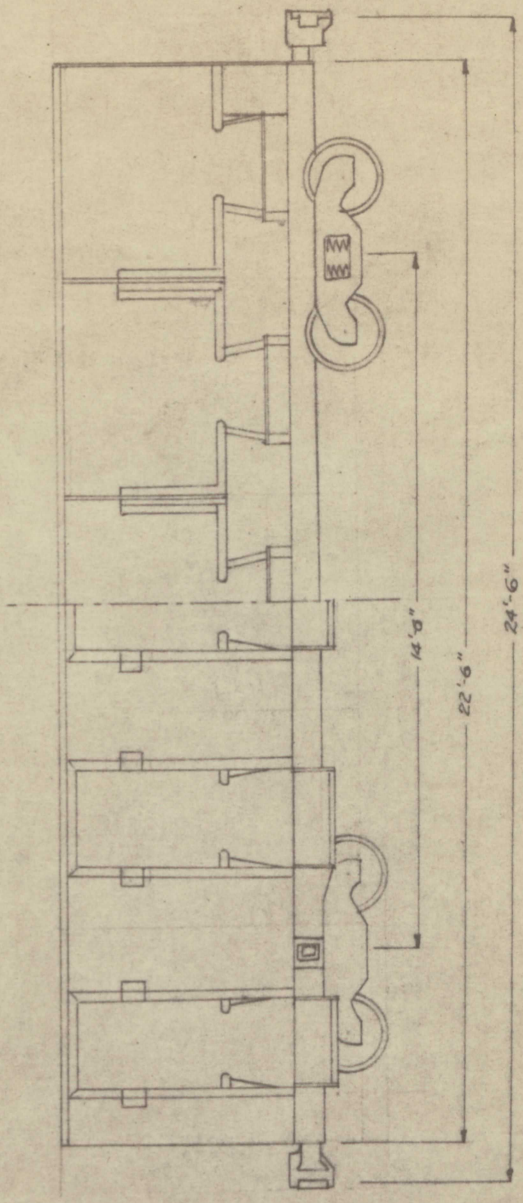
Eleven data sheets and 4 prints were received. The following cars are of particular interest.

Car No. 79. - These are 40 passenger man cars of welded steel construction. The car has spring wheel suspension. Wheel base is 14 ft - 6 ins., center-to-center of bolsters, with wheel and axle centers 18½ ins. each way from the center of the bolsters. Trains consist of 8 cars, and are used by the Climax Molybdenum Company at its mines at Climax, Colorado.

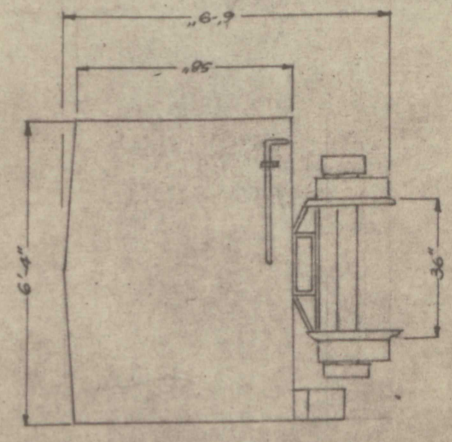
Car No. 80. - This 12 man car is used to transport men up and down a 12½° incline. A safety feature employed on this car is a set of safety dogs which automatically drop and stop the car when the tension on the hoist cable is reduced excessively. This car is in use at the Eagle Mine of the New Jersey Zinc Company, at Gilman, Colorado. Rope speed is 850 ft/min.

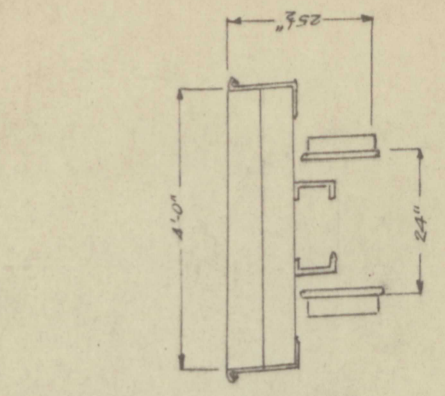
Car No. 81. - This is an 8 man car similar to Car No. 80, and is used by the same company.

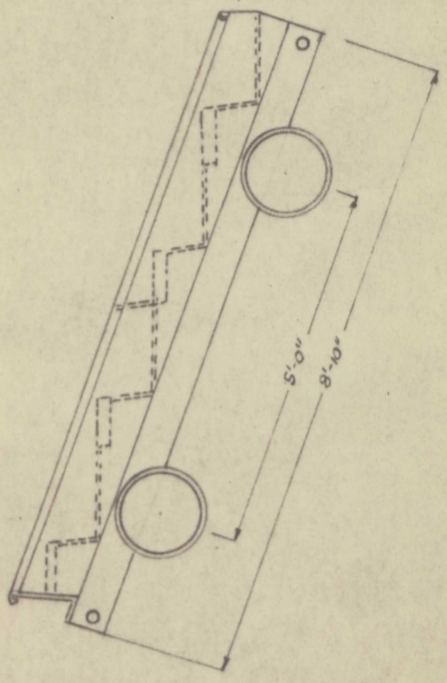
Car No. 82. - This is a powder car used at the Gilman, Colorado operations of the New Jersey Zinc Co. The capacity of the car is 2000, 9-ft fuses. The car body has 2 rubber lined steel doors hinged at the outside edges. The inside of the body is lined with 5/8-in. rubber, and the outside has alternate red and white stripes about 3 ins. wide, painted diagonally over the entire body.



CAR NO. 79 - PASSENGER CAR





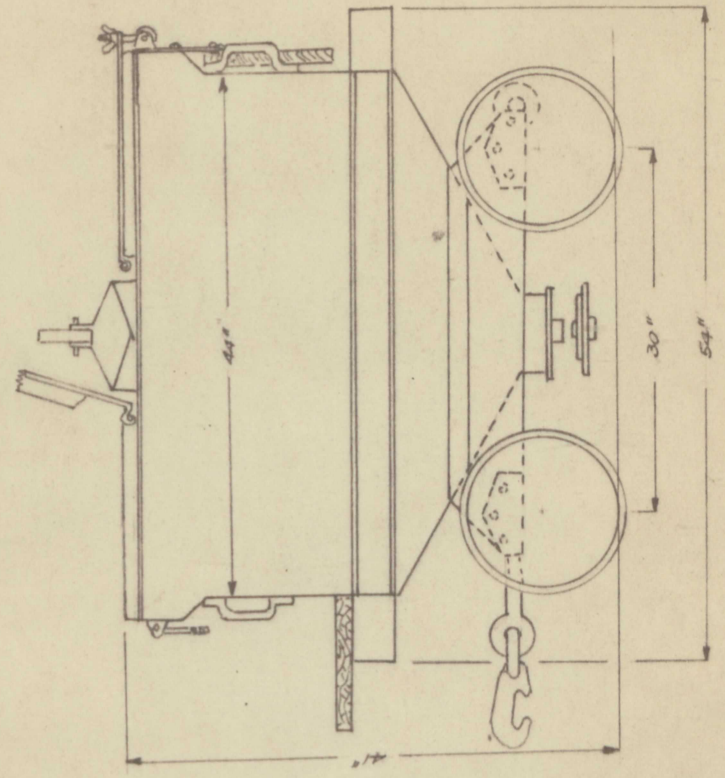


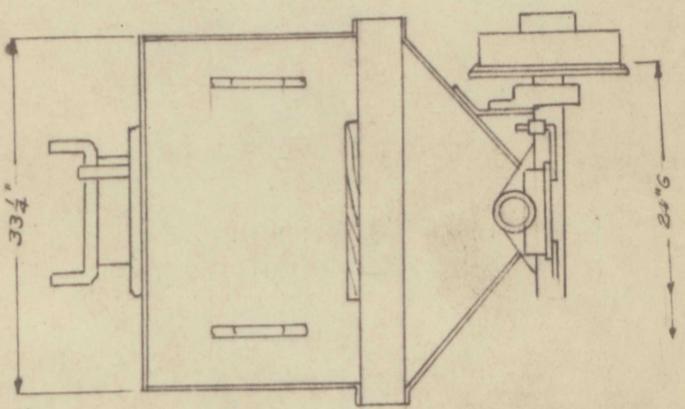
CAR NO. 80 - MAN TRIP CAR

Car No. 84. - This is a 150-gallon latrine car used at the same location as Cars No.'s 81. - 82. The car has a welded steel body. Covers over the 2 holes are fastened when not in use. The foot rest is folded up out of the way when the car is being moved. The car is cleaned out through a bottom valve.

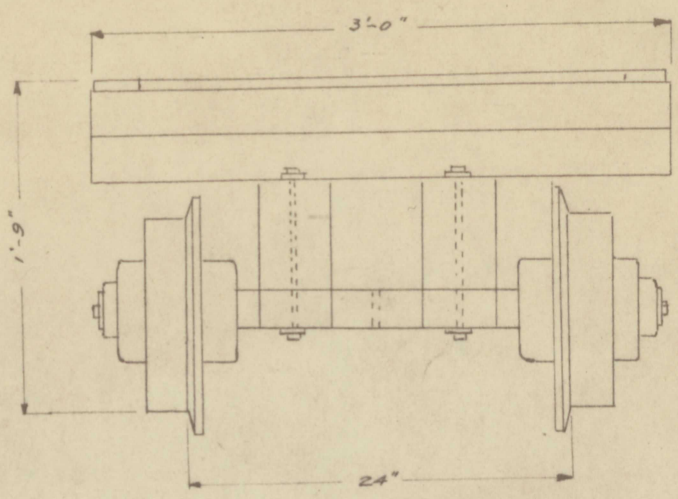
Car No. 85. - This is a steel car of the same company as Car No. 84. The car is divided into 3 one-foot compartments for the purpose of keeping the different lengths of steel separate. They are primarily used in conjunction with the jumbo drilling rigs in the headings as a storage for drill steel.

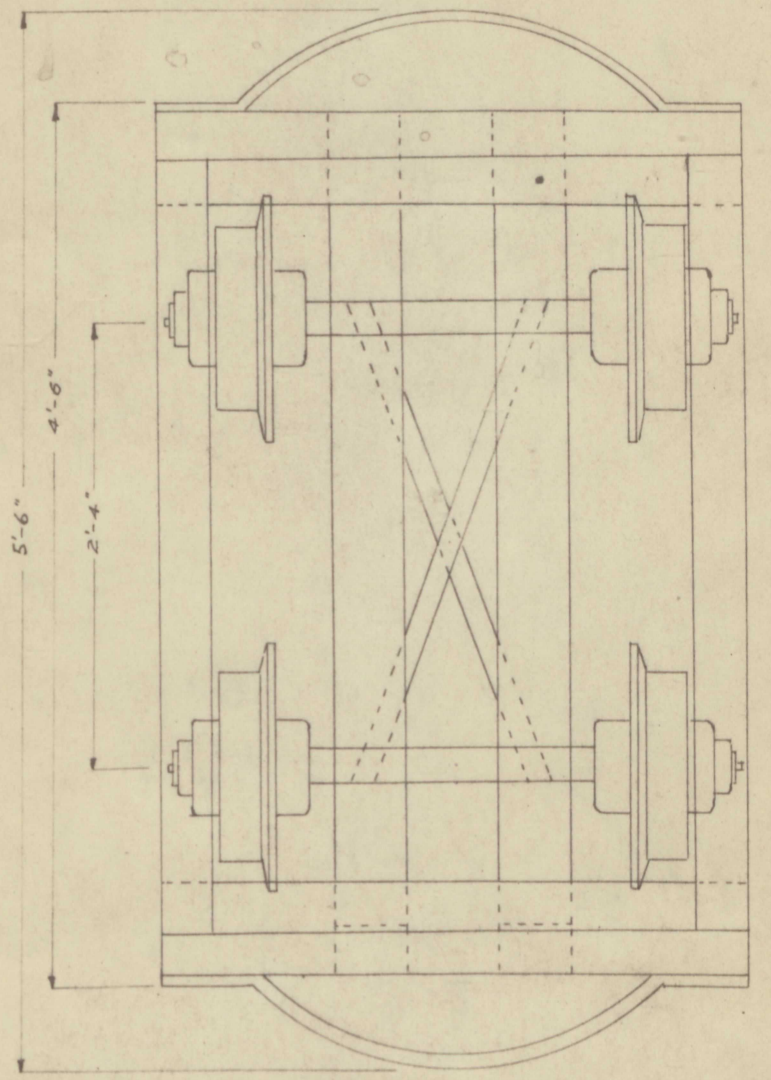
Car No. 87. - This is the timber car of the New Jersey Zinc Company at Gilman, Colorado. Timber is handled in bundles from the main surface supply to the various timber yards throughout the mine. These timber trucks are used to transport these bundles. They are also used in transporting 15-ft rail and 20-ft lengths of pipe.





CAR NO. 84 - LATRINE CAR





CAR NO. 87 — TIMBER TRUCK

COUPLERS

Since some confusion may exist as to nomenclature of couplers, and whether they are of an automatic or manual design, the following table will serve as a key for the classification of the couplers mentioned in this report.

TYPE OR NAME OF COUPLER	AUTOMATIC	MANUAL
Link and Pin		X
Link and Bar		X
Link, Split Link		X
Swivel		X
Chain and Ring		X
Chain		X
Ring and Hook		X
Ring and Pin		X
Drawhead		X
Drawbar		X
Spring		X
Willison	X	
M. C. B.	X	
Alliance	X	
Simplex	X	
National Malleable	X	
Allen and Garcia	X	
Knuckle	X	

TRACKLESS HAULAGE

Many companies are now using trackless haulage. In the Tri-State district haulage is chiefly by diesel truck. Mines reporting trackless haulage underground are as follows.

American Zinc, Lead, & Smelting Company	Joplin, Mo.	Diesel Trucks
Blue Diamond Corp.	Blue Diamond, Nev.	Shuttle cars
Cleveland Cliffs Iron Company	Keewatin, Minn.	Trucks
Duval Sulphur & Potash Company	Carlsbad, N.M.	Conveyor belt
Eagle-Picher Co..	Cardin, Okla.	Diesel trucks
Eagle-Picher Co.	Galena, Ill.	Diesel trucks
Greel Limestone Co.	Morgantown, W. Va.	Euclid diesels
Minerals Engineering	Glen, Montana	Not defined
Minerva Oil Co.	Cave-in-Rock, Ill.	Diesel trucks
Minerva Oil Co.	Baxter Spring, Kan.	Diesel trucks

Operational details of some the companies listed above are discussed below because of their particular interest to mine haulage.

Minerva Oil Co., Cave-in-Rock, Illinois. - Trackless haulage is by Chevrolet trucks equipped with Hercules diesel motors. Two trucks are used, one being a spare. Haulage distance is about 1000 ft. The ore is dumped into a crusher underground. From the crusher the ore travels along a 30-in., 1750-ft conveyor to a 900-ft cross belt which deposits the crushed rock into a 350-ton bin near the shaft. Three-ton skips move the ore to surface.

Drilling in the mine is with a Gardner-Denver 2-drill jumbo. Mining is of the room and pillar method. Each room is 9-ft high, and 18 to 20 ft wide. Drilling is on 2 shifts, employing throw-away-bits. Trucks are loaded with a 3-drum, 20-hp, IR tugger hoist on a Rogus ramp and Rogus track. A 42-in. Pacific scraper is used. Blasting is done on the evening shift.

A Hough payloader Model HMD is used for building roads. It was previously used for loading until lack of head-room prohibited such use.

Mine production is 300 tons per day.

Minerva Oil Co., Fluorspar Division, Eldorado, Illinois. - The 4 mines of the company in Hardin Co., Illinois, have recently been converted from mine cars and track haulage in favor of diesel truck haulage, 30-in. conveyor belts, or combinations of the two. This transition has effected the greatest overall economy of anything they have done, raising the output per mine man from 13 tons per man shift to 17.6 tons per man shift.

Loaders are either Hough HMD 1½-yd diesel endloaders, or Allis-Chalmers 1-yd HD-5G endloaders, or Rogers-type mobile ramps using 20-hp IR 3-drum electric hoists, and 42-in. scrapers for low ground. Hauling is by Ford or Chevrolet 2-ton end-dump trucks equipped with DOOD Hercules diesels. A 4-ton G.M.C. dump-truck is in experimental use. At the Crystal mine trucks emerge from a sloping adit and haul ore 1-mi to the mill-site. At Minerva No. 1 mine, the trucks haul to a panfeeder feeding the underground crusher. The crushed ore is taken to the shaft storage pocket via conveyor 30 ins wide, and 2400 ft long, and is hoisted to surface. Performance varies greatly with demands and conditions, but the potential is large, and maintenance costs are low. The secret of successful trackless haulage is good roads.
Costs.- Loading costs average about 18¢ per ton, and of this 5¢ and 12¢ are maintenance costs on equipment less than one year old, and older, respectively. Maintenance and rope costs on slushers is about 11¢. Haulage costs vary widely from

4¢ underground to 13¢ per ton-mile on long up-hill hauls. All these figures include labor, maintenance, fuel, and depreciation costs.

Greel Limestone Co., Morgantown, West Virginia. - This company operates limestone mines and quarries. Underground transportation was changed from mine cars to 15-ton Euclid dump trucks. Loading is by a 2-yd electric shovel.

CONCLUSION

The choice of mine cars to be used underground is governed by many factors. Where geology and other conditions permit, the use of trackless haulage methods should be considered.

Most metal mines find use for more than one type of mine car. An end-dump car of about 20 cu ft can be used for exploration, development, small scale mining and various sundry uses. A medium sized car such as the rocker type, averaging about 35 cu ft, can be used in development and medium tonnage haulage. Cars larger than 35 cu ft, such as Granbys, are used almost exclusively for high tonnage long distance haulage.

Various types of motive power are used in mine haulage ranging from human effort, compressed air, rope, battery, and trolley to diesel locomotives.

The factors regarding the type and design of mine cars in any particular mine can be summarized as follows, and should be considered prior to purchasing mine cars.

1. Cross-section of haulage drifts
2. Track curvature

3. Hoisting facilities (size of skips, cages, speed, etc.)
4. Number of cars per train
5. Track characteristics (gage, grade, weight of rail, etc.)
6. Type of motive power, speed, time for each trip
7. Mining methods, and tonnages to be handled
8. Original car cost, maintenance and operating costs
9. Loading methods, dumping methods
10. Safety
11. Material characteristics (ore, waste, specific gravity, wet or dry, etc.)

Another factor governing the type of mine car to be used is the personal choice of the superintendent and his staff, since everyone has his own opinions as to which car is best suited for a particular job. Various types of cars use the same gage track, as well as the same weight of rail. This is probably the result of personal ideas of supervisory officials both at the mine and at the fabrication plant. Where cars are manufactured in the companies own plant, the design and specifications of the mine car should suit the operating conditions of the mine. Mine cars purchased from a car manufacturer are usually of a general design. Mine plant shops should convert these cars to the specifications for their own mine conditions.

Finally, the most startling conclusion derived from the questionnaires was the realization that so many different types and sizes of mine cars are in use in the mines of the United States.